ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1907.

XLIX.—PLANT DISEASES.—VIII. DEGENERATION IN POTATOES.

(With Plate.)

G. MASSEE.

During the past few years many inquiries have been addressed to Kew as to the reason why potato tubers fail to form sprouts at the proper season, even when placed under the most favourable conditions for doing so. Last spring one correspondent stated that out of 70 tons of potatoes of high grade, especially intended for "seed," only five tons showed signs of sprouting, the remainder being disposed of, at a serious loss, for culinary purposes. This condition of things is not confined to this country. In Germany (*a*) serious losses have been sustained owing to the sterility of potato "sets," more especially of the kind known as Magnum Bonum. Very few of the eyes produced sprouts, and the "sets" at the time of lifting were not shrivelled and dried up as is the case under normal conditions, but on the other hand were solid and quite firm and in many cases had actually increased in size. In one instance where the "sets" were graded by a machine before planting, an increase in size of from one-half to three-quarters had taken place. This proves that the "sets" after planting had commenced growth a second season, and had accumulated the starch formed by the scanty amount of foliage produced. The new tubers formed by such plants were small and few in number. In many instances sprouts were not formed, and the "sets" remained intact in the soil throughout the season. The loss on the potato crop varied from about 5 per cent. to total loss, and averaged from 50 to 60 per cent. Investigations made by Dr. Schleh and Dr. Speikermann proved the absence of any specific disease, and the failure was in part attributed to the practice of growing the same kind of potato from sets produced on the spot for a long period of time.

In France Dr. Delacroix (*b*) has described the occurrence, on a large scale, of a similar sterility of potato tubers, which he calls

1375 Wt 87 8/07 D & S 29 29357

"filosité." In this case the few sprouts produced become considerably elongated, remain very slender, and usually do not appear above ground, and when they do so, produce only a few small stunted leaves. Here again there was an absence of disease, and the author considers that "filosité" is due to decadence and loss of vitality, brought about by the employment of the vegetative method of reproduction invariably followed. In those countries where attention is paid to the production of improved varieties of potatoes, certain points have been constantly kept in view. Amongst such may be enumerated : increase of crop ; improved flavour ; smooth and even surface ; immunity from disease. With the first three points cultivators have surpassed their most sanguine expectations, and it is hoped that by a strict application of Mendelian laws, a strain of potatoes immune to all ills will shortly be forthcoming.

Unfortunately the method of selection and the lines followed in producing these much desired improvements in potatoes have in some instances also favoured other unexpected modifications, which have resulted in sterility or the failure to form sprouts by the tubers. This failure has been shown, by a series of experiments conducted at Kew and extending over three years, to be accompanied by a combination of two distinct specific conditions : i., more or less arrest of the development of the vascular system of the tuber ; ii., comparative absence of the ferment or enzyme called diastase from the tuber.

A tuber, as is well-known, is the very much swollen terminal portion of an underground branch specialised for the purpose of a vegetative method of reproduction. Such tubers retain, under normal conditions, those structures present in the above-ground stem of a potato plant. The main bulk of a tuber consists of a mass of tissue crowded with starch, which is used up in the formation of new shoots or sprouts. This starch is conveyed to the growing shoots through certain portions of the fibro-vascular system, which appears to the naked eye, when a tuber is cut across, as a thin line forming a ring situated some little distance from the surface of the tuber. Branches from this ring pass outwards to the 'eyes' or sunken points from which the sprouts originate. Now the improvement in the tubers, from the culinary standpoint, which has resulted from these methods of selection and interbreeding has at the same time been accompanied by a serious degeneration of the fibro-vascular system ; in fact, in many examples that have been examined microscopically, this system is found to be so much reduced, especially in the branches connecting the main ring with the 'eyes,' as to be rendered incapable of conveying the necessary amount of food from the tuber to the growing shoots. Consequently the growing shoots are either not developed at all, or only developed as weakly branches devoid of vigour and soon perishing. It is a well-known fact that a quarter of a century ago stored potatoes (even the varieties most renowned for their 'mealy' or 'floury' qualities) were apt to become sweet in flavour, watery, and unsuitable for table purposes during the early spring months. Various methods of treatment were devised for preventing this deterioration from a culinary standpoint, more especially in the case of potatoes stored on board ship for use

during the prolonged voyages of that period. This defect is not apparent at the present day, and many of the best kinds remain unchanged in composition until midsummer or even for a longer period of time.

The primary object of the mass of starch stored up in a tuber is that of supplying formative material for the shoots during their early period of growth until leaves are developed. Before the starch can be utilised, however, it has to be converted into a liquid condition, when it is conducted through the elements of the fibro-vascular bundles to the growing-points. The solution of the starch is effected by means of a soluble ferment called diastase, which is produced in the tuber when the normal season for growth or sprouting arrives. Now in many high grade potatoes at the present day, diastase is produced in such small quantity that it is incapable of converting more than a very small proportion of the starch present into liquid sugar, hence the absence of sprouting is due to a lack of the food material necessary for the work. For the same reason many tubers remain almost unchanged as to starch contents when the crop is lifted in the autumn. These are illustrations of somewhat extreme cases, but the fact that potatoes in general remain 'floury' for a longer period of time than formerly, indicates a gradual and general loss of power on the part of potatoes to produce the necessary quantity of diastase.

Prunet's method (*c*) of determining the relative amount of diastase present in potatoes is as follows. Absolute alcohol is added to a definite amount of liquid pressed from crushed potatoes. The precipitate thus formed is collected on a filter and dissolved in a definite quantity of water. This solution, when added to a known quantity of water containing starch paste in solution, admits of the relative proportion of diastase present being determined by the rapidity with which the liquor ceases to be coloured by a solution of iodine.

By adopting the above method a total absence of diastase was proved in the case of tubers that had failed to sprout. In other examples the relative amount of diastase present was ascertained to be in proportion to the number of sprouts formed. Diastase is first formed, and in greatest abundance, at the apical or free end of a tuber, and for this reason the earliest and most vigorous sprouts are produced in this region in a normal tuber. When the presence of diastase is on the wane it also lingers longest in the apical region ; hence, in a large percentage of deteriorating tubers, sprouts from a single apical 'eye' are alone produced, as in Fig. 1 ; and in many instances, where the supply of food is very scanty owing to the absence of diastase, these sprouts perish at a very early age, as shown in Fig. 2. In Fig. 3, which illustrates the grower's ideal even surface—a factor of undoubted value when the loss resulting from paring is the object in view—the power of growing or sprouting has been completely lost, owing to deterioration of the fibro-vascular system and the comparative absence of diastase.

During the past three years a series of experiments have been conducted with the object of imparting new vigour to potatoes

intended for 'seed.' It must be admitted that the results obtained up to the present have not been very encouraging, the time being too short to remove the deterioration which has been established by a prolonged period of more or less intensive cultivation; nevertheless certain points have been noted which may prove to be of value to future experimenters.

Degeneration appears to be due mainly to the vegetative method of reproduction commonly followed. Even in the case of seedlings, the parents of these must, at least, be closely related.

Imperfect development of the fibro-vascular system is mainly due to the desire to obtain a potato with an even surface, that is, to abolish the sunken 'eyes' of the older type of potato. Selection has accomplished this point, but at the expense of germinating power. In the old type of tuber the 'eyes' were depressed to the level of the fibro-vascular ring, which supplied food directly to the sprouts springing from it. In the modern potato, resembling the surface and contour of an egg, the 'eyes' have dwindled to a mere suggestion of such, in other words the cortical portion of the tuber, or the portion outside the vascular ring, has increased in thickness, but the branches that connect the 'eyes' with the vascular ring from which they have been raised, are too often merely rudimentary, and fail to convey food to the sprouts.

On the whole, the failure of many otherwise excellent varieties of potatoes to grow vigorously is due rather to a lack of diastase than to morphological imperfections. This, as already explained, is manifested in the persistence of the starch in a solid form.

The nearest approach to a return to normal conditions has been met with in the case of potatoes grown for three years in succession on the same patch of sandy ground and without a trace of manure of any kind. The original 'sets' of a highly prized modern type were each reduced to the condition of being able to produce only one sprout at the apical end. The product of the third generation formed vigorous sprouts from every part of the tuber, thus proving that abandonment of all forcing or selective tactics enables the plants to regain their power of producing diastase. This result, however, was at the expense of all those points that have cost the cultivator so much time and labour to secure; the crop was small, the tubers few in number and only of average size and the 'eyes' were considerably depressed.

Superphosphate increased the amount of diastase to a much greater extent than a liberal dressing of farmyard manure.

Light favours the production of diastase much more than darkness, also a greater amount is produced in a high than in a low temperature.

A very interesting discovery on this point was made by Mr. Watson, Curator of the Royal Botanic Gardens. Some tubers that had refused to produce sprouts when placed under the most favourable conditions available to the ordinary grower, were placed in one of the forcing pits having a temperature averaging about 70° F. and were not covered. In due course sprouts

were formed freely at the apical end of the tubers in all the 'eyes.' The tubers were then planted in Mr. Watson's kitchen garden and duly yielded an ample crop of quite normal potatoes.

Literature quoted.

a. Deutsche Landwirtsch. Presse, Nos. 91, 94, 95, & 97 (1905).
b. Comp. Rend., Dec. 1903, p. 1006.
c. Comp. Rend., Dec. 1892, p. 241.

L.—THE CRICKET BAT WILLOW.

(With Plates.)

W. J. Bean.

No question in connection with profitable tree-planting has aroused greater interest in recent years than that as to the kind of Willow best adapted for the manufacture of cricket bats. It has only attained importance in recent times because it is only lately that the supplies of the best "Bat Willow" have become seriously limited and that prices have risen in proportion. At a sale of Willow trees on Sir Walter Gilbey's estate at Sawbridgeworth, in February, 1906, the best "Bat Willow" realised prices estimated to be equivalent to about seven shillings per cubic foot. I have recently been informed by the agent of a large estate in Essex that he had declined the offer of £1,500 for the best 100 Willows on the estate; and Mr. John Shaw, of the well-known firm of Shaw and Shrewsbury of Nottingham, last winter offered £40 for a single tree. When it is remembered that trees have been known in favourable situations to reach a saleable size in twelve years (having in that period attained a girth of about 50 inches) these prices show that there is no timber so profitable at the present time as that of the Cricket Bat Willow. It is not surprising, therefore, that the attention of owners of land suitable for the growth of Willows should have been attracted by this tree. As a matter of fact a large number of Willows have been planted during the last few years with a view to meeting the future demand. But we have it on the authority of Mr. Shaw, one of the largest buyers as well as a leading expert, that not more than one-fourth of the trees that are being planted are the best Cricket Bat Willow.

The identity of the true "Bat Willow" has always been obscure. The cricket bat maker recognises the tree best suited to his purpose with infallible certainty, but the characters on which he relies are not characters on which the botanist bases his distinctions. It is with a view to helping the planter to recognise the Willow best suited for cricket bats, and to avoid the unsuitable ones, that the matter is now being taken up in the *Kew Bulletin.*

It has for some time been evident to us at Kew that there is more than one Willow valuable for bat-making, although, perhaps,

not equally valuable. It has also been evident that whatever the best "Bat Willow" might be it was not so much a species in its entirety as a variety, or, perhaps, merely a local form. With a view to settling the identity of the true kind the Copped Hall estate near Epping, the property of Mr. Wythes, was visited in company with Mr. Shaw. Here a large quantity of "Bat Willows" are growing, and specimens were collected of the different sorts whose respective values for bat-making were certified by Mr. Shaw. They have since been botanically identified, and for assistance in this work we have to express our obligations to the Rev. E. F. Linton, M.A., the well-known authority on British Willows. The expert knowledge of the cricket bat manufacturer has, therefore, been joined to that of the botanist and it now remains to put on record the conclusions at which we have arrived.

The "Open-Bark" Willow.

(*Salix fragilis*, L.)

The two commonest terms used in describing Willows from the bat-maker's standpoint are "open-bark" and "close-bark." There is no difficulty or mystery about the "open-bark." It is the Crack Willow—the *Salix fragilis* of Linnaeus—a common tree on the banks of the Thames near Kew. Although a useful timber in other respects, it is of very inferior merit for the making of cricket bats. It is, in fact, used only for the manufacture of cheap bats for children, such as are sold in toy shops rather than by the genuine athletic outfitter. They are of a reddish colour. In connection with the present question, the "open-bark" or Crack Willow should only be known in order to be avoided.

Botanical characters of *Salix fragilis*.—A *tree* 80 to 90 feet high with spreading branches; *branches* growing at angles of 60° to 90°. *Leaves* coarsely serrate, usually somewhat pubescent at first; *pubescence* deciduous. *Stamens* silky at extreme base only. *Ovaries*, in the commonest (probably unfertilised) state, almost subulate, but ovate-lanceolate in the fertilised condition, gradually narrowing to a distinct style; their *pedicels* ultimately three to four times the length of the nectary.

The Best "Close-Bark" Willow.

(*Salix alba*, L., var. *caerulea*, Syme [S. caerulea, *Smith*].)

The Willow selected by Mr. Shaw as the very best one for bat-making is a tree of markedly pyramidal habit; it is female or seed-bearing; and it belongs to the bluish-leaved variety of the White Willow. It is, therefore, a pyramidal form of *Salix alba*, var. *caerulea* ♀. The bark is less rough than in *S. fragilis*, and the corrugations are less prominent, straighter and more continuous up and down the trunk of the tree. The wood is white, and when it is being split does not part so easily as the "open-bark" does, but splinters a good deal. This splintering, or tearing, down the cleft is regarded as an evidence of good quality.

THE "OPEN-BARK" WILLOW.

Salix fragilis, L.

To face page 312.

THE BEST "CLOSE-BARK" WILLOW.

Salix alba, L., var. *caerulea*, Syme.

29357

To face page 313.

According to Mr. Shaw this particular tree is only to be found at the present time in the counties of Essex, Hertford and Suffolk. A few trees were at one time growing in Kent and Surrey, but it is his belief that the true "Bat-Willow" is no longer to be obtained there. Neither Cambridgeshire nor Lincolnshire has it, nor does it exist (except for recent plantings) north of the Trent. This all goes to show that this Willow is a local form, and that only those "sets" can be relied on which have been obtained from the right district. *Salix alba*, var. *caerulea* ♀ is grown at Kew, where there are two fine specimens on the banks of the Lake. But although in character of leaf and fruit they are identical with the trees on the Copped Hall Estate, in habit they are quite different. The trunks have forked low, and the habit is more spreading. Although some of the Copped Hall trees are growing in hedgerows and have ample room for lateral development, their tapering pyramidal form is a most noticeable characteristic. This is well shown in the illustration.

The pyramidal shape of the tree is associated with, and may in some measure be due to, a great vigour of growth. And it is reasonable to conclude that it is this vigorous growth which gives to the timber those peculiar qualities which render it better adapted for cricket bat-making than any other variety of White Willow. It is a remarkable fact that of all the hundreds of timbers now available from the tropical and temperate parts of the globe the only tree yet known to produce a timber of the right quality is found in a few counties in England.

In regard to quality of timber for cricket bats, the typical *S. alba* appears to be intermediate between *S. alba* var. *caerulea* and *S. viridis* (v. below). A tree at Copped Hall was considered by Mr. Shaw to be of second rate though of fairly good quality.

Botanical characters of *Salix alba*.—A *tree* 70 to 80 feet high with ascending or erect *branches* growing at angles of from 30° to 45°. *Leaves* finely serrate, silky pubescent, *pubescence* permanent. *Stamens* more silky in the lower half than those of *S. fragilis*. *Ovaries* ovate-conic, abruptly obtuse, sessile or with the pedicels shorter than the nectary ; *style* very short or absent.

S. alba, var. *caerulea* differs from ordinary *S. alba* in the leaf being glabrescent and of a bluish green tint. The ovaries are identical.

Botanically there is no well-marked dividing line between *S. alba* and *S. alba* var. *caerulea*, the two being united by intermediate forms. It is possible that the quality of timber improves as the tree approaches the latter.

Salix viridis, Fries.

There is another Willow recognised by Mr. Shaw as a "close-bark" and of a useful quality, but still inferior to that of *Salix alba*, var. *caerulea*. Although it is not easy to put on paper the differences between the "open" bark of *S. fragilis* and the "close" bark of the true "Bat Willow" in such a way that they

can be indubitably recognised, they are appreciated easily enough when seen in the field. But the differences between the two "close" barks, although perfectly evident to the expert eye of Mr. Shaw, are by no means obvious to the uninitiated. Nor was it possible after careful "coaching" to fix on any distinctive features in the bark as a help for future occasions. This, however, is only one more of those instances, common to pretty nearly every walk in life, where distinctions clear enough to the trained eye are quite hidden from the outsider.

But although the bark afforded no help in the differentiation of the two "close-barks," the trees were distinct enough in other respects. The habit of this second tree was more spreading than that of *S. alba*, var. *caerulea*; the leaf was smaller and not so blue; and the trees, being devoid of fruit, were presumably male. Mr. Linton considers this tree to be *Salix viridis* of Fries.

Salix viridis is a hybrid between *S. alba* and *S. fragilis* and as these species frequently grow together they have no doubt cross-bred very many times. It is quite probable also that the progeny have interbred with the parent species again. At any rate *Salix viridis* is a very variable tree, showing numerous intermediate gradations between the two parents—sometimes approaching *S. alba* and *S. alba*, var. *caerulea* so closely in leaf as to be indistinguishable from them, and sometimes showing very distinctly the influence of *S. fragilis*. Its advent into the Cricket Bat Willow question has created a good deal of confusion. A specimen approaching *S. alba*, var. *caerulea* may be described as good by the bat-making expert, whereas another approaching *S. fragilis* will be accounted inferior. Yet to the botanist both are *S. viridis*.

From the bat-maker's point of view the timber of *Salix viridis* is not so good as that of *S. alba*, var. *caerulea* because the wood is coarser and heavier. A bat made of good *S. viridis* timber would weigh about 2 lb. 7 oz. to the 2 lb. 4 oz. of *S. alba*, var. *caerulea*. The difference in market value is also so considerable as to be important to intending planters. Mr. Shaw stated that, for trees of equal size, buyers would give £10 for the *S. alba*, var. *caerulea*, but only £6 for the *S. viridis*.

With regard to the botanical characters of *Salix viridis*, it is difficult to give a concise description. It has already been explained that it is a hybrid between *S. alba* and *S. fragilis*, with which it has bred and interbred till it now forms an almost complete series of links between those two species. Therefore *S. viridis* in its various characters is more or less intermediate between the other two; this refers more especially to the angles at which the branches grow; the serration and pubescence of the leaf; the density of the flowers on the male catkins; the size of the ovaries, the length of their pedicels and the distinctness of their styles. In some states, again, *S. viridis* has one set of organs, say leaves and twigs, resembling one parent, whilst the ovaries are almost identical with those of the other. In practice, as the late Dr. Buchanan White observed, it requires the trained eye of the salicologist to detect and balance up the various characters that go to make *Salix viridis*.

Salix Russelliana, Smith.

In connection with the "Bat-Willow" question the name of *Salix Russelliana* frequently crops up, and is a source of considerable confusion. A correspondent of Kew complains that whilst one person tells him that *Salix Russelliana* is an excellent Willow for bat-making, another says that it is quite worthless. The probable explanation of this is that "Russelliana" is a name that has been given to two different Willows. Most commonly it has been applied to the "Crack Willow" (*S. fragilis*); in that connection, therefore, it indicates the very inferior Willow for bat-making. But the name has also been given to the hybrid between *Salix alba* and *S. fragilis* which, as has already been explained, is itself a variable plant, but is often of good, although not the best, quality. The name "Russelliana" is now no longer used by the leading authorities on British Willows, so that those interested in the Cricket Bat Willows would do well to discontinue its use.

Popular and Local Names.

Another source of confusion arises from the use of local names. So misleading are they, that they should be dispensed with altogether in connection with the present question, since it is hopeless now to find one popular name restricted to one particular Willow. A name given to a particular species or variety may be in general use in one district, but it may be given to quite a different tree in another. In the course of consulting various works in connection with the Cricket Bat Willows the curious fact has been noticed that the terms "Huntingdon Willow" and "Leicestershire Willow" have both been applied to *Salix alba*, to *Salix alba*, var. *caerulea*, and to *Salix fragilis*.

Propagation and Cultivation.

It will have been gathered from what has been said that there is at the present time a brisk demand for young trees or "sets" of the true "Bat-willow." Enquiries are being continually addressed to Kew as to where they can be obtained, but we know of no one at the present time who is able and willing to supply them in quantity. It is of little use applying to the ordinary trade firms. With the best will and the most honest intentions they may supply the wrong tree, because, as has already been pointed out, it is not *Salix alba* var. *caerulea* merely that is wanted.

So far as our present knowledge takes us it is the erect-growing form alone that can be relied on, and then possibly the female plant only, and it is only safe to plant stock which has come originally from the counties of Essex, Suffolk, or Herts.

The usual method of propagating this Willow is by means of "sets." These "sets" are branches cut as thick as or thicker than a broom-handle, with the minor branches and twigs removed; they are thus transformed into bare rods which when planted are 8 to 10 feet or even more in length. "Sets" of about this length are preferred so that the young growths may be out of reach of cattle, &c., and the young trees away from the various dangers

that beset them when they are near the ground. They are also suitable for thrusting in hedgerows and such-like situations. Care should be taken to prevent cattle from injuring the stems. In some places Willows are being pollarded for the especial purpose of producing "sets" of the desired size. But with the present demand for this Willow this seems a slow and cumbersome means of propagation; slow, that is, to produce a large quantity; no doubt for the individual tree it may be the quickest. This Willow is one of the most easily propagated of all trees, for every twig will grow. I would recommend the use of cuttings which can be made of any shoots as thick as a goose-quill and, say, 1 foot long. Cuttings of this character, planted in the Arboretum nursery at Kew last spring, are already (in August) 6 feet high. For thicker wood the cuttings may be proportionately longer. These can be put in the ground in autumn or early spring. As they grow it would be necessary to keep them each to a single leader and to prune back the side branches and remove the lower ones as the plants grow in height. In well-kept nursery ground fine healthy plants could be produced in two or three seasons, and they could be grown to planting-out size at the rate of 8,000 or more to the acre.

Whilst these Willows like abundant moisture, a position by the side of water is not necessary. The fine specimen here illustrated is, with several others, growing in a deep, rather heavy clay, with only an ordinary hedge-row ditch on one side. Mr. Shaw told me he preferred timber grown in such a position to that of trees growing close to the edge of ponds, &c.

Young trees should be watched to see that they are kept to a single leading shoot. This will obviate the forking of the trunk low down, which, of course, detracts from the value of the tree by reducing the amount of good timber. Trees, however, are more liable to fork when growing in isolated positions than they are when close together in plantations.

LI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XLIV.

431. **Meconopsis (Eumeconopsis) Forrestii,** *Prain* [Papaveraceae-Eupapavereae]; e grege *Primulinarum*, foliis caulibusque setosis, floribus pedicellis ebracteis in cymas racemiformes dispositis, petalisque 4 ad *M. lancifoliam* accedit, sed *Primulinis* caeteris floribus pallide coeruleis stigmateque sessili statim differt.

Herba setis retrorso-patentibus pallide stramineis valde induta. *Rhizoma* fusiforme, 10 cm. longum, 1·5 cm. crassum. *Folia* radicalia pauca, lanceolata vel anguste subspathulata, obtusa vel subacuta, sensim versus basin caulem vaginantem attenuata, 12–16 cm. longa, 1·5–1·75 cm. lata, margine integra, supra pallide

viridia, subtus glaucescentia, utrinque sparse setosa. *Caulis* ad 25 cm. usque altus, simplex, nudus, setis retrorsis obsitus, quadrante, summo tantum floriferus ibique subito versus apicem attenuatus, ceterum cylindricus ·75 cm. crassus. *Flores* in cymas racemiformes 3–5-floras dispositi, flos terminalis erectus, caeteri pedicellis gracilibus subrigidulis ebracteis circa 1 cm. longis patentes vel subreflexi. *Sepala* oblongo-ovata, extra parum setosa. *Petala* 4, oblonga, pallide coerulea, glabra. *Stamina* indefinita, pluriseriata, filamentis coeruleis discretis glabris; antherae (ex sicco) aureae. *Ovarium* e carpellis 4 compositum, glabrum; stylus 0; stigma oblongum, 4-sulcatum; placentae intrusae; ovula plurima. *Capsula* adhuc ignota.

China. Yunnan; open mountain pasture-land among rocks and on the margins of cane-brakes, on the eastern flank of the Likiang range, Lat. 27° 12′ N., alt. 10–11,000 ft.; in flower in June, *Forrest*.

A very distinct species of the group *Primulinae* in the section *Eumeconopsis*, but with flowers of a much paler blue than in any of the other species of that group. With *M. lancifolia* it agrees in having 4-petalled flowers and raceme-like cymes, the other three species of the group normally having simple scapes. From all the other species of the group *M. Forrestii* differs in having no style. But while this is the case the stigma is oblong and the stigmatic rays are decurrent; in the other species with sessile stigmas so far known (*M. integrifolia* and *M. punicea*; group *Grandes*; *M. Oliveriana*; group *Chelidonifoliae*) the stigma is depressed and the stigmatic rays are radiating.

432. **Rosa Willmottiae**, *Hemsl.* [Rosaceae]; species ex affinitate *R. Webbianae*, Wall., a qua aculeis aequalibus, calyce eglanduloso, sepalis quam petalis multo brevioribus et petalorum colore differt.

Frutex dense ramosus, 1·5–3 m. altus, praeter stipulas glanduloso-ciliatas fere glaber, ramis brunneo-rubris. *Aculei* in ramis floriferis geminati, recti, 8–10 mm. longi, pallidi, setis nullis. *Folia* conferta, 2–3 cm. longa; rhachis gracillima, minutissime setulosa; stipulae minutae, supra medium liberae, apice obtusae, margine eximie glanduloso-ciliatae. *Foliola* saepissime 9, brevissime petiolulata, oblonga, obovata vel interdum fere orbicularia, 4–8 mm. longa, praecipue supra medium subduplicato-denticulata. *Flores* roseo-lilacini vel roseo-purpurei, (alabastris saturate rubris) 3·5–4 cm. diametro, in ramulorum lateralium brevium apicibus solitarii, brevissime pedunculati. *Sepala* lanceolata, caudato-acuminata, circiter 1 cm. longa, integra, intus albo-tomentosa. *Petala* subintegra. *Filamenta* brevissima, antheris aureis. *Styli* hirsuti, liberi. *Achaenia* dorso villosa. *Fructus* maturus ignotus.

China. Cultivated by Messrs. James Veitch & Sons from seeds collected by Mr. E. H. Wilson in the mountains of Sangpan, at elevations of 2,800 to 3,300 metres.

It is named in compliment to Miss Willmott, F.L.S., V.M.H., of Great Warley, whose interest and work on roses is well known. A drawing has been made of this novelty for the *Botanical Magazine*.

433. **Erodiophyllum acanthocephalum**, *Stapf* [Compositae-Asteroideae-Bellideae]; ab *E. Elderi*, F. Muell., foliis tenuius dissectis, involucri phyllis triangulari-ovatis, paleis longuiscule spinescentibus angustis, radiis brevioribus latioribus distinctum.

Herba e basi ramosa, circiter 12 cm. alta, undique pilis longis multicellularibus cateniformibus mollibus obsita. *Caules* pallidi, leviter sulcati. *Folia* infima oblanceolata, dentata, caetera (plurima) ambitu obovato-lanceolata, basi longe in petiolum anguste alatum attenuata, pinnatipartita, segmentis utrinque 3–4 haud contiguis anguste oblongis vel obovato-oblongis acute dentatis, cum petiolo 5–7 cm. longa, ad 2–5 cm. lata. *Pedunculi* pallidi, 4–6 cm. longi. *Capitula* subglobosa, cum ligulis ad 2 cm. lata. *Involucri* bracteae triangulari-ovatae, acutae, 8–9 mm. longae, 5 exteriores ad sinus in cornua deflexa apice spinuloso-dentata productae, pilosae. *Receptaculum* demum cylindrico-conicum, ad 1 cm. longum, 5 mm. latum, durum. *Paleae* flores fertiles subtendentes lanceolatae, in spinam longuisculam abeuntes, inferiores ad 8 mm. longae, demum recurvae, caeterae rectae, inferne pubescentes et ad margines ciliatae; interiores membranaceae, inter se magis minusve in cupulas ovaria efoeta cingentes et aequantes connatae. *Corollae* tubus glandulosus, florum radii 3 mm. longus, florum disci masculorum 5 mm. longus; radii ligulae oblongae, obtusae, circiter 12 mm. longae, 4 mm. latae, albae. *Achaenia* matura ad 2 mm. longa, pappi coronula dimidio breviore.

West Australia. Laverton, scarce, *F. A Rodway.*

This genus was hitherto very imperfectly known. It was described by F. von Mueller from very scanty material, collected by Young between Elizabeth River (west of Torrens Lake) and Youldah Water (30° 23′ S.L. 131° 47′ E.L.) in South Australia. As the genus was represented at Kew only by a single leaf, a branch of Mr. Rodway's plant was sent to Professor Ewart at Melbourne, to be compared with von Mueller's type. He confirmed the determination so far as the genus was concerned, but suggested that it was a distinct species. His notes and a few fragments he was good enough to send prove this to be the case. Mr. Rodway's specimen being so much more complete than F. von Mueller's original, an amended description of the genus is here added.

Erodiophyllum, F. Muell. (descr. emend.).

Capitula multiflora, heterogama, radiata, floribus radii discique exterioribus ♀ fertilibus, centralibus numerosis ♂ cum pistillo efoeto. *Involucri* bracteae herbaceae, basi connatae, 5–8. *Receptaculum* convexum, paleaceum, paleis flores fertiles subtendentibus rigidis spinescentibus, caeteris (interioribus) membranaceis et basi inter se magis minusve connatis. *Corollae* radii ligulatae, conspicuae, florum disci ♀ ad tubum brevissimum vel subnullum redactae, florum ♂ tubulosae, 5-dentatae. *Antherae* ecaudatae, apice appendiculatae, basi filamentis impositae. *Stylus* filiformis, profunde bifidus; crura lineari-filiformia, florum ♀ secundum margines et ad apice minute denseque papillosa, florum ♂ magis applanata papillis minus densis longioribus rigidulis. *Achaenia* matura obpyramidata, triangulata, laevia; pappus florum ♀ e squamis magis minusve in cupulam connatis demum crassis suberosis formatus.— Herbae perennes, hispidae. *Folia* alterna,

numerosa, pinnati-lobata, lobis dentatis vel infima indivisa, dentata. *Capitula* solitaria, pedunculata, matura multispinosa. *Ligulae* albae ; discus luteus.

434. **Rhododendron Benthamianum**, *Hemsl.* [Ericaceae-Rhodoreae] ; species *R. yunnanensi* proxima, a qua foliis crebrius lepidotis non setulosis et florum colore differt.

Frutex usque ad 3 m. altus, sed plantae cultae tantum 30 cm. altae jam florentes, glaber, dense ramosus, ramis crassiusculis rufo-brunneis. *Folia* ad ramorum apices conferta, saepe terna, coriacea, persistentia, oblongo-lanceolata, cum petiolo circiter 1 cm. longo 3–6 cm. longa, apiculata, basi rotundata, supra reticulata et lepidibus atris obscuris parce instructa, subtus lepidibus orbicularibus elegantibus radiatim multistriatis aureis et brunneis intermixtis densissime vestita. *Flores* saepius terni, breviter pedicellati, purpureo-violacei, circiter 6 cm. diametro ; pedicelli circiter 1 cm. longi, ut calyx brevissimus lepidoti. *Calycis dentes* rotundati. *Corolla* extus praesertim dorso lepidota, intus basi puberula ; lobi rotundati, recurvi, postico intus maculis deltoideis atro-brunneis instructo. *Stamina* 10, inaequalia, longiora corollam vix excedentia ; filamenta infra medium dense villosa, ima basi et supra medium nuda. *Ovarium* densissime lepidotum, stylo glabro breviter exserto.

China. Szechuen ; in woods near Tatsienlu, 2400–3300 m., *Wilson*, 3940, 3942 ; *Pratt.*

Described from a living specimen communicated by Messrs. James Veitch & Sons, raised from seeds collected by Mr. Wilson.

Wilson, 197, in Herb. Kew from Western Hupeh is perhaps the same species though some of the leaves are as much as 8 cm. long and the flowers are larger.

435. **Primula muscarioides**, *Hemsl.* [Primulaceae] ; ex affinitate *P. cernuae*, Franchet et *P. deflexae*, Duthie, a priore foliis distincte crenatis, a posteriore foliis majoribus crenatis calyce efarinoso et corollae lobis vix emarginatis differt.

Folia subcarnosa laete viridia, obovato-spathulata, 10–12 cm. longa, rotundata, deorsum attenuata sed haud vere petiolata, crenato-dentata, ciliolata, supra pilis mollibus obscuris parce vestita, subtus glabra vel cito glabrescentia, costa carnosa crassa, inter venas primarias leviter bullata. *Scapi* erecti, quam folia fere duplo longiores. *Bracteolae* lineares, calyce breviores. *Flores* numerosi, subcarnosi, densissime capitato-spicati, deflexi ; spicae 2·5–3·5 cm. longae. *Calyx* campanulatus ; lobi erecti, inaequales, ovato-oblongi, minute ciliato-glandulosi, posteriore latiore emarginato florum superiorum atro-purpureo. *Corolla* anguste infundibularis, vix 1 cm. longa, saturate purpureo-coerulea ; lobi quam tubus cylindricus dimidio breviores, subtruncati, suberecti, leviter emarginati, circiter 3 mm. lati. *Antherae* subsessiles, tubo infra medium affixae. *Stylus* tubum paullo excedens. *Capsula* ignota.

China. Without special locality. Described from a specimen received from the 'Bees,' Ltd., Neston, Cheshire.

This species, *P. cernua*, Franchet, *P. deflexa*, Duthie and *P. pinnatifida*, Franchet, are very closely allied and perhaps not all deserving of specific rank, but at present we prefer to keep them separate.

Wilson's 4036 is very similar in aspect, but the leaves are very much more hairy and the calyx is farinose.

P. muscarioides has, so far as the Kew material goes, almost sessile anthers near the base of the corolla-tube, and the stigma projects slightly from the mouth of the tube. *P. cernua*, in the specimen examined, has the anthers attached near the top of the tube, and the style is only about 1 mm. long. In Wilson's 4036, which has been referred to *P. deflexa*, Duthie, the anthers are attached a little above the middle of the corolla-tube and are overtopped by the slightly exserted style. Thus we have trimorphism of the genitalia in this very distinct little group of *Primula*.

436. **Incarvillea Younghusbandi** *Sprague* [Bignoniaceae-Tecomeae]; habitu *I. compactae*, Maxim. similis, capsula brevi lata arcuata ab ea recedit.

Herba subacaulis, foliis cataphyllaribus anguste triangularibus, superioribus lanceolatis. *Folia* sub anthesi 3–7, pinnati-partita, 1·5–6 cm. longa; petiolus ·5–2·5 cm. longus, plano-convexus, ut rhachis venaeque minutissime pubescens; lamina rugosa, venis supra impressis subtus valde prominentibus, margine minutissime ciliata, ceterum venis exceptis glabrata; segmenta lateralia utrinque 4–7, opposita vel subopposita, oblonga vel ovato-oblonga, obtusa, interdum subapiculata, irregulariter crenato-crispata, foliorum maximorum usque ad 13 mm. longa, 6 mm. lata, terminale suborbiculare, irregulariter crenatum, usque ad 2 cm. diametro. *Flores* 1–5-fasciculati; bracteolae lineari-subulatae; pedicelli 4–12 mm. longi. *Calyx* campanulatus, extra minutissime puberulus, inconspicue 5-nervis; tubus 5–8 mm. longus; lobi lanceolati, recurvato-acuminati, minute ciliolati, 2–4·5 mm. longi. *Corolla* purpurea, infundibuliformis, nigro-punctata (praesertim lobi), extra glabra, intus infra insertionem staminum glandulosopilosa; tubus 3·5–5·5 cm. longus; lobi elliptici, 10–15 mm. longi, 15–23 mm. lati. *Stamina* supra medium tubi inserta, antherarum lobis oblique ovatis, 2–2·5 mm. longis. *Discus* circa ·3 mm. altus. *Ovarium* 5–6 mm. longum, lepidotum; stigmatis lobi flabelliformes, ciliati; ovula pro loculo irregulariter 2-seriata, circa 14 pro serie. *Capsula* lignosa, arcuata, apicem versus angustata, 2·5–3 cm. longa, 8–9 mm. lata; valvae costis media et lateralibus conspicuis. *Semina* anguste lacerato-alata, 5–6 mm. longa, 3–4 mm. lata, utrinque papillis crassis dense induta.

TIBET. Khamba Jong, 4,500 m., July 5, 1903, *F. E. Younghusband*, 21; Sept., 1903, *F. E. Younghusband*, 316; *D. Prain*; Giri, 4,650 m., July, 1903, *F. E. Younghusband*. Between Phari and Gyangtse, 3,000–4,500 m., June, 1904, *H. J. Walton*; Gyangtse, 3,960 m., July–September, 1904, *H. J. Walton*, 103. Between Phari and Shigatze, *King's Collection* (1882). Near Tuna, 4,500 m., collected by an officer of the Transport Department, Indian Army, name unknown.

437. **Incarvillea longiracemosa**, *Sprague* [Bignoniaceae-Tecomeae]; ab affini *I. Principis*, Bur. et Franch., foliolorum forma, ramis inflorescentiae aphyllis, floribus majoribus recedit.

Herba caulescens, 38–41 cm alta, minute puberula. *Folia* sub anthesi 2–5, alterna, pinnata, 12–21 cm. longa; foliola 7–8, sessilia, ovata vel ovato-oblonga, obtusa, interdum minute apiculata, basi rotundata vel truncata, margine ± crenato-serrata, lateralia 2–4 cm. longa, 1–2·5 cm. lata, terminale 6–6·5 cm. longum, 2·5–3·5 cm. latum, interdum cum supremo vel 2 superioribus lateralium conjunctum, venis lateralibus utrinque 4–6. *Inflorescentia* racemosa, terminalis et axillaris; rachis usque ad 16-flora; rami axillares 1–4-flori, aphylli; pedicelli 3–8 mm. longi, infra medium 2-bracteolati, bracteolis lineari-lanceolatis vel lanceolatis. *Calyx* tubuloso-campanulatus, 5-nervis, minute puberulus; tubus 1·5–1·7 cm. longus; lobi ascendentes ovato-deltoidei, acute acuminati, 5–6 mm. longi, apice recurvi. *Corolla* anguste campanulato-infundibuliformis, extra glabra, intus (praesertim lobis) pilis minutis capitatis densiuscule induta; tubus 4–4·5 cm. longus; pars basalis cylindrica, 8–9 mm. longa; lobi suborbiculares, circa 1 cm. longi. *Stamina* 14–15 mm. supra basin corollae inserta, antherarum lobis ellipticis, 4–5 mm. longis, connectivo supra lobos 1 mm. producto. *Discus* annularis, ab ovario remotus, vix ultra 1 mm. altus. *Ovarium* circa 1 cm. longum, ovulis medio placentarum imbricatim 4-seriatis, apice 1-seriatis, basi 2-seriatis.

Tibet. Between Phari and Shigatze, *King's Collector* (1882); Yam Dok Cho, 4,500 m., Aug., 1904,. *H. J. Walton.*

438. **Iris Wilsoni**, *C. H. Wright* [Iridaceae-Moraeeae]; *I. sibiricae*, Linn., affinis, floribus luteis differt.

Rhizoma breviter repens 8 cm. diam. *Folia* linearia, acuminata, 60 cm. longa, 8 mm. lata, flaccida, minute scabridula. *Scapus* 20 cm. altus, cylindricus; spathae herbaceae, late lanceolatae, acuminatae, 9 cm. longae; pedicelli 7–10 cm. longi, cylindrici, virides. *Perianthii* tubus viridis, trigonus, 8 mm. longus; segmenta exteriora oblanceolata, 5 cm. longa, 1·6 cm. lata, dilute lutea, nervis purpureis dimidio inferiore notata, callis duobus parvis erectis oblique triangularibus prope basin instructa; segmenta interiora erecta, oblanceolata, 4 cm. longa, 8 mm. lata, lutea. *Filamenta* complanata, dilute lutea; antherae albae. *Ovarium* triquetrum, 12 mm. longum, 7 mm. latum; styli rami lutei; cristae bifidae obtusae, eroso-denticulatae.

Western China. *E. H. Wilson.*

Var. **major** *C. H. Wright*. *Pedicelli* vix 4 cm. longi. *Perianthii* tubus 12 mm. longus; segmenta exteriora oblanceolato-spathulata, lutea, 6·5 cm. longa, limbo 2·5 cm. lato; segmenta interiora 4 cm. longa, 2·5 mm. lata. *Filamenta* lutea, purpureo-striata. *Ovarium* triquetrum, 18 mm. longum, 7 mm. latum; styli rami 1·6 cm. lati, lutei, ad costam et prope apicem dilute castanei; cristae ut in typo.

Western China. *E. H. Wilson.*

439. **Herbertia Amatorum**, *C. H. Wright* [Iridaceae-Moraeeae]; *H. amoenae*, Griseb., affinis, styli ramis acutis differt.

Cormus globosus, tunicis brunneis. *Folia* lanceolata, plicata, acuminata, basi attenuata, 20 cm. longa, 8 mm. lata. *Scapus* 45 cm. altus, vix 2 mm. diam., cylindricus, glaber; rami 14 cm.

longi, tenues. *Spathae* herbaceae, exterior 2·5 cm. longa, interior fere duplo longior. *Perianthium* 5 cm. diam.; segmenta exteriora interioribus triplo longiora, obovato-cuneata, obtusa, 3 cm. lata, violacea, intus ad mediam albo-costata, unguis maculo cordato albo coeruleo-marginato instructa; interiora e basi oblonga lanceolata, acuta, violacea, basi brunneo-maculata. *Antherae* obscure virides. *Stylus* carneus, ramis acutis.

URUGUAY. Monte Video, *Cantera*.

Described from a plant which flowered at Kew in May, 1907, having been raised from seeds collected and sent by Dr. Cantera in 1903. The three heart-shaped areas edged with blue at the base of the outer perianth-segments are very characteristic.

440. **Agave** (**Littaea**) **Watsoni**, *J. R. Drummond et C. H. Wright* [Amaryllidaceae-Agaveae]; ab *A. horrida*, Lemaire, et ei affinibus propter foliorum vittam marginalem attenuatam infrâ prope obsoletam primo visu distinguitur; ab *A densiflora*, Hook., foliorum aculeis marginalibus remotis facile dignoscenda est; differt vero ab *A. expatriata*, J. N. Rose in Rep. Miss. Bot. Gard. xi. (1900), 82, cui omnino vicina, scapo breviore spicâ minus elongatâ, latiore, foliis rigidis, versus basin facie superiore convexâ, aculeis marginalibus parum uncinatis.

Folia 15–20, rigida, exteriora patentia, paullum recurvata, anguste oblongo-lanceolata, circâ 50 cm. longa, e basi ad 9·5 cm. dilatatâ, 8 mm. densâ, in collum 5·5 cm. latum mox constricta, inde ad circâ 22 cm. suprâ basin, quo 7·5 cm. latitudinis attingunt, gradatim expansa, facie superiore versus basin convexâ; sursum explanatâ, denique leviter concavatâ; interiora autem erecta, angusta, in bracteas sensim abcedentia. *Foliorum margines* vitta tenuissimâ castaneâ, in senectis cinerascente, ornati, aculeis e basi compressâ deltoideâ argute acuminatis, rectis vel parum uncinatis, circiter 5 mm. longis, inter se circâ 2 cm. distantibus, minuti, at sub folii apicem nonnihil involuti, cornei, in spinam terminalem, e cervice arctâ subito exortam, argutissime canaliculatam circâ 1·8 cm. longam, confluentes. *Scapus* ad basin 3·5 cm., sub spicam inflorescentem 2 cm. diametro, altitudine vix 3-orgyalis, cylindricus, bracteis, praeter infimas, patentibus, subtiliter sulcatis, albidis, instructus; *bracteae* inter alabastra inconspicuae, vix 1 cm. longae, infrâ pedetentim ampliatae, e basi deltoideâ herbaceâ, circa 4 mm. latâ, arcte constrictae, et in setam firmam, subulatam, scariosam mox conduplicatae, circum imam basin, tamen, pedunculi multo majores, ad 30 cm. longae, subfoliaceae, marcescentes, erectae. *Flores* in fasciculis bini, rarius terni, et tunc uno flore, saltem, saepius duobus abortivis, in pedicellos valde abbreviatos, incrassatos, doliiformes, binis bracteolis minutis, infrâ dilatatis herbaceis, sursum scariosis argute acuminatis, amplexos, insidentes, spicam fusiformem, diametro circâ 9·5 cm. staminibus prominentibus quasi crinitam formantes. *Germen* longitudine 13–14 mm., latitudine 5 mm. attingens, laeve vel (oculo armato) obscure puberulum, viridescens, subtriquetrum; *tubus* diametro circâ 4 mm. subito constrictus, manifeste 6-sulcatus; *lobi* perianthii (flore maturo) carnosiusculi, dorso subherbaceo, oris minus incrassatis albido-pellucidis, apice cucullato penicillato, germen longitudine subaequantes. *Antherae* 1 cm. longae, cum filamentis,

demum 28 mm. longis, summâ parte subulatis, infrâ dilatato-complanatis post excussum pollinem flaccescentibus, plus minusve purpureo-notatae. *Stylus* subcylindricus robustus, longitudine 3·5 cm., diametro 5·2 mm., albido-pellucidus, sursum et ad oras papillosi stigmatis purpureo suffusus.

This fine *Littaea* was acquired during 1906 from the collection of Mr. Justus Corderoy at Didcot, and has 'poled' this spring in the Succulent House at Kew; the native country is not known with certainty, but it is believed to have been obtained originally from Central America. From Mr. Baker's group of 'Marginatae' it is at once distinguished by the extremely narrow border of the leaf, and from all the 'Sub-marginatae' except *A. pumila*, which is otherwise a very different type, by the structure of the inflorescence, which rather approaches that of *A. densiflora*, Hook. in *Bot. Mag.* t. 5006. From *A. densiflora* however it is very certainly marked off by the margin-prickles, which in that are far closer together.

The nearest known form seems, by the description, to be the *Littaea* described as *A. expatriata* by J. N. Rose in the Eleventh Report of the Botanic Garden at St. Louis, but in Rose's plant the flower spike, from the illustration (processed from a photograph), is much longer and narrower, and the stamens are less conspicuous; the margin-prickles also in *A. expatriata* appear to be larger and more hooked than in the present species, and the surface of the leaf is more concave. In the Kew plant the leaves approach those of *A. decipiens*, Baker (a *Euagave*), in a tendency to be convex above the base on the upper side, also in the colour, and this seems to be the case with *A. densiflora* also.

LII.—THE GENUS PERGULARIA.

N. E. Brown.

The genus *Pergularia* as established by Linnaeus (*Mantissa* i, p. 8), has hitherto been misunderstood. The writer, when elaborating the tropical African Asclepiads did not examine the characters of the genus as given by Linnaeus. Now that this has been done it transpires that, as *Pergularia*, Linnaeus has very accurately and unmistakably described the generic structure of the plants on which Robert Brown afterwards founded the genus *Doemia* (usually but incorrectly written *Daemia*). The chief points in Linnaeus's description of the genus *Pergularia* are as follows:—"Corolla monopetala, hypocrateriformis. Tubus cylindricus, calyce longior. Limbus quinquepartitus, planus: Laciniis oblongis. Nectaria quinque, semisagittata, erecta, compressa, attenuata in mucronem, incurva, basi exteriore dente nutante. Filamenta vix ulla. Antherae quinque, corpusculo truncato stigmatis immersae." The above characters correctly apply to those plants now placed in the genus *Doemia*, but do not at all accord with those at present considered to belong to the genus

Pergularia, nor to any other plants at present known in the whole of the *Asclepiadaceae*, since the structure of *Doemia* is peculiar and not to be mistaken for that of any other genus. Under *Pergularia*, Linnaeus (*Mantissa* i., p. 53) has described only two species, viz., *P. glabra* and *P. tomentosa*. On referring to the Linnean Herbarium it is found that the two species are represented as follows :—*P. glabra* consists of a very good flowering specimen of *Vallaris pergulanus*, Burm. fil., which is a native of Java and the Malay Peninsula, and belongs to the order *Apocynaceae*, having a floral structure totally different from Linnaeus's generic characters, so that this plant is certainly not the one on which he established the genus *Pergularia*.

P. tomentosa consists of a piece of stem with two pairs of leaves, without flowers or buds. This specimen has a label on which is written in somewhat large handwriting "No. 19," and the word "Chin" (intended for China) in the small writing of Linnaeus, and on the back of the sheet Linnaeus has written as follows :— "Macao China Theologi catholici ex hujus succo lacteo p̄parant medicinum pro dysenterica." But Linnaeus states under *P. tomentosa*, first, that it is a native of Arabia, collected by Forsköhl, secondly, by the letters "H. U." at the end of the description, that it was cultivated in the Botanic Garden at Upsala. From this, therefore, as well as from the fact that there are no flowers from which he could have constructed his generic characters, it is quite clear that the Chinese specimen (which may possibly have been collected by Osbeck) is not the type of the description of *P. tomentosa*. Therefore, so far as generic identification is concerned, there is no specimen, named *Pegularia* by Linnaeus himself, in his Herbarium, to represent this genus as he has defined it. The error of generic identification was commenced by Sir James Edward Smith, who, in his *Icones Pictae*, under t. 16, has identified the Chinese specimen named *Pergularia tomentosa* in the Linnean Herbarium with that which he figures on t. 16 (also from China) as *P. odoratissima ;* in this identification he is doubtless correct, but as stated above, it is a totally different plant from that on which Linnaeus's description of *P. tomentosa* is based, and Smith was quite wrong in referring *P. tomentosa*, Linn., as a synonym, to *P. odoratissima*, Sm. Afterwards, Robert Brown (in *Mem. Wern. Soc.* i., p. 50) added to the confusion by repeating the error made by Smith, and by establishing the genus *Doemia* (with characters by which alone, without reference to the specimens quoted, the genus could not possibly be recognised) upon the very plants Linnaeus must have seen or had before him when he described the genus *Pergularia*, since there are none in any other genus that will accord with his very careful and clear description. This is a case where the description by Linnaeus is based upon one plant, whilst the specimen in his Herbarium, supposed to represent the description, is a totally different plant. Such cases, unfortunately, are of not infrequent occurrence, and this is emphasised, with regard to *Pergularia tomentosa*, by the fact that the specimen in the Linnean Herbarium named by Linnaeus "*Cynanchum monspeliacum*" is not that well-known European plant, but is a good flowering specimen of *Doemia extensa*, R. Br. Indeed, I suspect that this

may be the very specimen on which Linnaeus based his description of the genus *Pergularia*, mentioned under *P. tomentosa* as cultivated at Upsala, and that it has been wrongly named by Linnaeus. With regard to Linnaeus's description of *P. tomentosa*, in the diagnosis of the plant, he states that the leaves are tomentose, whilst in the description under the diagnosis they are stated to be glabrous. This would seem to imply that he saw a specimen collected by Forsköhl which has tomentose leaves and was referable to *Doemia cordata*, R. Br., whilst the cultivated plant with glabrous leaves, from which the body of this description was doubtless made, perhaps raised from seed sent by Forsköhl, was evidently *D. extensa*, R. Br. Both of these species grow in Arabia; they differ chiefly by their leaves and indumentum, their flowers being very much alike.

The above being the facts as regards *Pergularia*, I propose to re-establish the genus in the sense that Linnaeus intended. But as it seems clear that Linnaeus combined two species under the name *P. tomentosa*, I propose to retain that name for the tomentose-leaved plant only.

For the plants which have hitherto been known by the generic name *Pergularia*, the name *Prageluria* may be substituted; this being an anagram of the former name will make the smallest change possible.

LIII.—MISCELLANEOUS NOTES.

M. T. Masters.—The late Dr. Maxwell Tylden Masters, whose death, on May 30th, was quite unexpected, although he had been ill for about a month, was from early life a correspondent of Kew, a worker at Kew, and a contributor from time to time of seeds, dried specimens and museum objects. He was the son of William Masters, a nurseryman, of Canterbury, and was born on April 15th, 1833. His father was a remarkable man in many ways, and one of the few, in those days, of his calling who possessed scientific attainments associated with practical knowledge. Apart from his business, he was very active, politically, socially and industrially. He was an alderman of the City of Canterbury, and served as Mayor, and was the Founder and Honorary Curator for many years of the Museum. He was also much interested in Kew Gardens, and corresponded with the late Sir William Hooker from 1846 to 1862, chiefly in relation to offers of donations from his exceedingly rich collection of living plants, which he cultivated as much for pleasure as profit. Under the title of *Hortus Duroverni* he published an excellent catalogue of plants and seeds which he offered for sale. We have only seen the third edition of this now very rare, little known and highly interesting horticultural publication, compiled on the model of Loudon's *Hortus Britannicus*. It appeared in 1831, and a copy of it was presented to Kew by the late Dr. Masters in 1898. We find no record of the other editions.

Dr. Masters was educated at King's College, and qualified for the medical profession, which he practised for some years. His first

post after leaving college was that of Sub-Curator of the Fielding Herbarium at Oxford, to which he refers in an undated letter, written from King's College, to Sir William Hooker, whose herbarium he was to examine in order to get some insight into its arrangement before going to Oxford. In another undated letter, written from the Oxford Botanic Gardens, he informs Sir W. Hooker that he had been induced to offer himself as a candidate for the Chair of Botany at King's College, vacant by the resignation of his former teacher, Professor Edward Forbes, and asks for a testimonial ; adding that he had already delivered one course of lectures on botany at the London Institution, and was then engaged in delivering a similar course at the Royal Institution. Although there are no dates to these letters, we know that they were written when he was quite a young man, for in 1855 he was chosen Lecturer on Botany at St. George's Hospital, a post which he held until 1868. He was also for some years Examiner in Botany in the University of London, for the Society of Apothecaries, and for the Civil Service. On the death of Dr. J. Lindley in 1865, Masters was appointed his successor as editor of the *Gardeners' Chronicle*, in conjunction for many years with the late Thomas Moore ; the duties of this post he performed up to within just a month of his death. Apart from his editorial work, Masters was a prolific writer, as may be learnt from the appended bibliography, and most of his descriptive botany was done at Kew. As early as 1865 his name appears two or three days a week in the visitors' book, when he was occupied on his first contributions to the *Flora of Tropical Africa* and the *Flora of British India*. To a certain extent he was a specialist ; the Malvales, Passiflorales, Aristolochiaceae, Nepenthaceae, Restiaceae, and Coniferae being his favourite groups.

Masters became a Fellow of the Linnean Society in 1860, and in 1870 he was elected into the Royal Society. He was an M.D. and a M.R.C.S., and he was also an Honorary or Corresponding member of numerous societies, both English and Foreign. Foremost among his foreign distinctions was that of Corresponding Member of the Institute of France, to which he was elected in 1888. In the same year he was decorated with the insignia of Chevalier of the Belgian Order of Leopold.

He was an indefatigable worker ; a strong supporter of Kew, the Royal Horticultural Society and the Gardeners' Societies and Institutions. How much he was esteemed and admired may be gathered from the numerous highly sympathetic and eulogistic sketches of his life and work which have appeared in the horticultural and botanical press of the world ; and many of us have lost a good kind friend.

Mrs. Masters has presented most of her husband's Botanical Collections to Kew, with permission to select what is required and to send the remainder to Oxford. There has not yet been time to examine them, but the Coniferae evidently form the greater and the most valuable part. We are informed that his Herbarium of British Plants, in accordance with the deceased's wish, has been presented to his native city Canterbury.

Bibliography.

The following enumeration does not include contributions to the *Gardeners' Chronicle* and it is probably otherwise incomplete, as Masters was a contributor to many publications, sometimes anonymously. For example, he edited and contributed to the *Report of the International Horticultural Exhibition and Botanical Congress*, held in London in 1866, though his name does not appear on the title page; and he was also a contributor to the *Encyclopaedia Britannica*.

On the Arrangement of the Air-cells in Aquatic Plants The Ashmolean Society's Proceedings, 1853, vol. iii. pp. 16–19. Report of the British Association, 1854, part 2, p. 102.

Notes on some Kentish Plants. The Phytologist, vol. i. p. 189. 1855.

Note on a Monstrosity of the Flowers of Saponaria officinalis. Journal of the Linnean Society, vol. i. pp. 159–162. 1857.

On the Flowering Plants and Ferns of Oxfordshire and the contiguous counties. The Ashmolean Society's Transactions, vol. iii. (Reprint, pp. 15). 1857.

Contributions to Vegetable Teratology. The Phytologist, vol. ii. p. 449, 1857–58.

On the Relation between the Abnormal and Normal Formations in Plants. Proceedings of the Royal Institution, vol. iii. pp. 223–227; Pharmaceutical Journal, vol. ii. pp. 34–37. 1858–62.

Remarks on Vegetable Morphology and the Theory of the Metamorphosis of Plants. Report of the British Association, 1859, part 2, pp. 136–138. 1859.

On a new species of Bellevalia (B. muscarioides) from Mount Ida. Journal of the Linnean Society, vol. iii. pp. 113–114. 1859.

Notes on Muscari latifolium, Kirk. Transactions of the Botanical Society of Edinburgh, vol. vi. pp. 114–116. 1860.

On the Relation between Pinnate and Palmate Leaves. Report of the British Association, 1861, part 2, pp. 148–149. 1861.

Vegetable Morphology: Its History and Present Condition. British and Foreign Medico-Chirurgical Review, vol. xxix. pp. 202–218. 1862.

Note on an Unusual Mode of Germination in the Mango (Mangifera indica). Journal of the Linnean Society, vol. vi. pp. 24–26, ff. 1–3. 1862.

On Prolification in Flowers, and especially on that form termed Median Prolification. Transactions of the Linnean Society, vol. xxiii. pp. 359–370, t. 34. 1862.

On Prolification in Flowers, and especially on that kind termed Axillary Prolification. Transactions of the Linnean Society, vol. xxiii. pp. 481–493, t. 54. 1862.

A Description of some remarkable Malformations affecting the genus Lolium. Journal of the Linnean Society, vol. vii. pp. 121–122, ff. 1–2a. 1863.

On the Existence of two forms of Peloria. Natural History Review, 1863, pp. 258–262. 1863.

Remarks on the Theory of the Metamorphosis of Plants. Transactions of the Botanical Society of Edinburgh, vol. vii. pp. 54–55. 1863.

On Certain Forms of the Common Rye-grass (Lolium perenne, Linn.). Journal of Botany, vol. i. pp. 6–9. 1863.

On the Morphology and Anatomy of Philydrum lanuginosum, Br. Journal of Botany, vol. i. pp. 105–106. 1863.

On the Anatomy of the Leafstalk in Thalia dealbata. Journal of Botany, vol. i. p. 107. 1863.

Double Orchids. Journal of Botany, vol. ii. pp. 344–346. 1864.

Remarks on some Malformed Flowers observed by Mr. W. G. Smith. Journal of Botany, vol. iii. pp. 109–110, t. 28, ff. 9–12. 1865.

Observations on the Morphology and Anatomy of the genus Restio, Linn., together with an Enumeration of the South African Species. Journal of the Linnean Society, vol. viii. pp. 211–254, tt. 14 & 15. 1865.

On a Peloria and Semidouble Flower of Ophrys aranifera, Huds. Journal of the Linnean Society, vol. viii. pp. 207–211. 1865.

On the Corona of Narcissus. Journal of Botany, vol. iii. pp. 105–109; vol. iv. pp. 265–267, t. 28, ff. 1–8. 1865–66.

Lindley, J., & T. Moore. The Treasury of Botany, edited by J. L. and T. M. London, 1866. 2 vols. 800. (Other editions or issues in 1870, 1874, 1876, 1884, and 1889.) Numerous articles by M. T. Masters, signed M. T. M. 1866.

On some Double Flowers of Primula sinensis. Journal of the Royal Horticultural Society, new series, vol i. pp. 202–204. 1866.

Notes on Double Flowers. Proceedings of the Botanical Congress, London, 1866, pp. 127–142. 1866.

Dombeya angulata, Cav. Journal of Botany, vol. v. pp. 78–81. 1867.

Note on Double Flowers of Ranunculus Ficaria, etc. Journal of Botany, vol. v. pp. 158–159. 1867.

On Polliniferous Ovules in a Rose (Rosa arvensis). Journal of Botany, vol. v. pp. 318–322, t. 72 B. 1867.

Note on the Presence of Stamens within the Ovarium of Baeckea diosmaefolia, Rudge. Journal of the Linnean Society, vol. ix. pp. 334–335, t. 7. 1867.

On a Double-flowered Variety of Orchis mascula. Journal of the Linnean Society, vol. ix. pp. 349–355, tt. 10 & 11. 1867.

Harvey, W. H., The Genera of South African Plants. Ed. 2, by J. D. Hooker. Cape Town and London, 1868. 8vo. pp. 411–416. Restiaceae. 1868.

On the early Spring-flowering species of Scilla. Journal of Botany, vol. vi. pp. 335–339. 1868.

Sensitive Plants. Popular Science Review, vol. vii. pp. 22–33. 1868.

Oliver, D. Flora of Tropical Africa (continued by Sir W. T. Thiselton-Dyer).

vol. i. pp. 175–214. Malvaceae (1868).
„ i. pp. 214–239. Sterculiaceae (1868).
„ i. pp. 240–268. Tiliaceae (1868).
„ ii. pp. 492–500. Samydaceae (1871).
„ ii. pp. 500–501. Loasaceae (1871).
„ ii. pp. 501–503. Turneraceae (1871).
„ ii. pp. 503–520. Passifloraceae (1871).

Monographie du Codiaeum variegatum et de ses variétés horticoles. Belgique Horticole, xix. pp. 65–76. 1869.

On the relative value of the Characters employed in the Classification of Plants. Report of the British Association, 1869, part 2, pp. 114–115; Journal of Botany, vol. vii. pp. 292–293. 1869.

Vegetable Teratology. An Account of the Principal Deviations from the Usual Construction of Plants. London, 1869. 8vo. pp. xxxviii. + 534.
(German Edition by U. Dammer. Leipzig, 1886. 8vo. pp. xvi. + 610. t. 1).

On the genus Fremontia. Journal of Botany, vol. vii. pp. 297–298. 1869.

On some points in the Morphology of the Malvales, together with a description of a new genus of Buettnerieae, Scaphopetalum. Journal of the Linnean Society, vol. x. pp. 18–30, tt. 2 & 3. 1869.

Synopsis of the South African Restiaceae. Journal of the Linnean Society, vol. x. pp. 209–279, tt. 7 & 8. 1869.

On the Structure of the Flower in the genus Napoleona, etc. Journal of the Linnean Society, vol. x. pp. 492–504. 1869.

The Peculiar Cut-growths of Bridgesia spicata. Monthly Microscopical Journal, vol. iii. p. 203. 1870.

Contributions to the Natural History of the Passifloraceae. Transactions of the Linnean Society, vol. xxvii. pp. 593-646, tt. 64 & 65. 1871.

Grafting: its Consequences and Effects. Popular Science Review, vol. x. pp. 141–154. 1871.

The Passifloraceae. Flora Braxiliensis, vol. xiii. pars 1, pp. 529-628, tt. 106–128. 1872.

Bud-variation. Popular Science Review, vol. xi. pp. 244–256. 1872.

Reports of Experiments made in the Gardens of the Royal Horticultural Society in 1869 and 1870 on the Influence of various

Manures on different Species of Plants. Journal of the Royal Horticultural Society, new series, vol. iii. pp. 19–79, 124–158. 1872.

Botany for beginners. London, [1872]. 8vo. pp. xiii. + 185. (Russian Translation. St. Petersburg, 1873.) 1872.

Note on the genus Byrsanthus, Guill., and its Floral Conformation. Journal of the Linnean Society, vol. xiii. pp. 15–20. 1873.

On the Development of the Andraecium in Cochliostema, Lem. Journal of the Linnean Society, vol. xiii. pp. 204–209, t. 4. 1873.

The Battle of Life among Plants. Popular Science Review, vol. xii. pp. 35–45. 1873.

Sexuality in Plants. Popular Science Review, vol. xiii. pp. 363–374. 1873.

Hooker, J. D., Flora of British India.

vol. i. pp. 317–353. Malvaceae (1874).
„ i. pp. 353–379. Sterculiaceae (1874).
„ i. pp. 379–409. Tiliaceae (1874).
„ i. pp. 572–598. Olacaceae (1875).
„ ii. pp. 598–603. Passifloraceae (1879).

Monographic Sketch of the Durioneae. Journal of the Linnean Society, xiv. pp. 495–507, tt. 14–16. 1875.

Remarks on the Structure, Affinities, and Distribution of the genus Aristolochia, with descriptions of some hitherto unpublished species : [A. Pearcei, A. pannosa, A. imbricata, A. unguli-folia]. Journal of the Linnean Society, vol. xiv. pp. 487–495. 1875.

Note on the Bracts of Crucifers. Journal of the Linnean Society, xiv. pp. 391–399, ff. A & B. 1875.

On the Restiaceae of Thunberg's Herbarium. Journal of the Linnean Society, vol. xiv. pp. 413–421. 1875.

On Monstrous Flowers of Daucus Carota and Scrophularia aquatica. Journal of Botany, vol. xiii. 1875, pp. 79–80. 1875.

The Bitter Cola (Garciniae, sp.). Journal of Botany, vol. iv. 1875, pp. 65–67, t. 160. 1875.

On Deidamia Thompsoniana, DC. Journal of Botany, vol. iv. 1875, pp. 161–163, t. 163. 1875.

The Aristolochiaceae. Flora Brasiliensis, vol. iv. pars. 2, pp. 77–114, tt. 17–26. 1875.

On the Hungarian Oak (Quercus conferta of Kitaibel) as cultivated in the Royal Botanic Garden, Edinburgh. Transactions of the Botanical Society of Edinburgh, vol. xii. pp. 436–441. 1876.

On Certain Small-fruited Pears. Journal of Botany, vol. v. 1876, pp. 225–229, 297–298; t. 180. 1876.

Remarks on the Superposed Arrangement of the parts of the Flower. Journal of the Linnean Society, vol. xv. pp. 456–478. 1877.

Classified Synonymic List of all the Species of Passifloraceae Cultivated in European Gardens, with references to the Works in which they are figured. Journal of the Royal Horticultural Society, vol. iv. pp. 125–148, tt. 6–8. 1877.

The Restiaceae. De Candolle, Monographiae Phanerogamarum, vol. i. pp. 218–398, tt. 1–5. 1878.

Note on the Dimorphism of Restiaceae. Journal of Botany, vol. vii. pp. 36–37, t. 194 II. 1878.

Side-lights on the Structure of Composites. Journal of Botany, vol. vii. 1878, pp. 33–36; t. 194 I. vol. viii. 1879, pp. 6–7, t. 200 B; vol. xi. 1882, pp. 39–41. 1878–82.

On the Nomenclature of Garden Plants. Journal of the Royal Horticultural Society, new series, vol. v. pp. 126–135. 1879.

Notes on Root-hairs and Root Growth. Journal of the Royal Horticultural Society, new series, vol. v. pp. 173–186. 1879.

On some points in the Morphology of the Primulaceae. Transactions of the Linnean Society, series 2, vol. i. pp. 285–300, tt. 39–41. 1880.

Note on the occurrence of a Restiaceous Plant [Leptocarpus disjunctus, n. sp.] in Cochin China. Journal of the Linnean Society, vol. xvii. pp. 343–345. 1880.

Notes on the Relations between the Morphology and Physiology in the leaves of Certain Species of Conifers. Journal of the Linnean Society, vol. xvii. pp. 547–552. 1880.

The Conifers of Japan. Journal of the Linnean Society, vol. xviii. pp. 473–524, tt. 19 & 20. 1881.

Dimorphic Leaves of Conifers. Nature, vol. xxiii. p. 267. 1881.

Moore, T. Epitome of Gardening, with an introduction by M. T. Masters. Edinburgh, 1881. 8vo. pp. xii. + 444. 1881.

Note on the Foliation and Ramification of Buddleia auriculata. Journal of the Linnean Society, vol. xix. pp. 201–204. 1882.

On a new species of Gossypium from East Tropical Africa [G. Kirkii]. Journal of the Linnean Society, vol. xix. pp. 212–214. 1882.

Fruit of Opuntia. Nature, vol. xxvii. p. 126. 1882.

Results of Experiments on the Mixed Herbage of Permanent Meadows, Conducted for more than Twenty Years in succession on the Same Land. Part 2, Botanical Results (in conjunction with Sir John Lawes and Sir Henry Gilbert). Philosophical Transactions of the Royal Society, vol. clxxiii. pp. 1181–1433. 1883.

Life on the Farm.—Plant Life. (Handb. Farm Series, ed. J. C. Morton.) London, 1883. 8vo. pp. viii. + 142. 1883.

New Passifloraceae. Journal of Botany, vol xxi. 1883, pp. 33–36. 1883.

Double Flowers. Nature, vol. xxvii. p. 126. 1883.

On the Passifloraceae collected by M. Édouard André in Ecuador and New Grenada. Journal of the Linnean Society, vol. xx. pp. 25–44, tt. 19 & 20. 1884.

Henfrey, A. An elementary course of Botany. Ed. 4, by M. T. Masters, assisted by A. W. Bennett. London, 1884. 8vo. pp. xii. + 724. 1884.

On the Comparative Morphology of Sciadopitys. Journal of Botany, vol. xxii. 1884, pp. 97–105, ff. 1–5. 1884.

Flowers out of Season. Nature, vol. xxxi. pp. 13–15. 1884.

Pinetum Britannicum. A descriptive account of hardy Coniferous Trees cultivated in Great Britain (edited by A. Murray and E. Ravenscroft). Edinburgh and London, [1863]–84. 3 vols. fol. The botanical descriptions in parts 30 to 51 were contributed by M. T. Masters. 1884.

Notes on certain Passifloraceae from Western Tropical America. Journal of Botany, xxiii. 1885, pp. 113–116. 1885.

On Petalody of the Ovules and other changes in a double-flowered form of "Dianella caerulea." Nature, vol. xxxi. pp. 487–488. 1885.

Supplementary Notes on Restiaceae. Journal of the Linnean Society, vol. xxi. pp. 574–594. 1885.

Autumnal Flowering. Nature, vol. xxxv. pp. 11–12. 1886.

On the Root-Structure and Mode of Growth of Primulaceae in Relation to Cultivation. Journal of the Royal Horticultural Society, new series, vol. vii. pp. 236–254, ff. 8–26. 1886.

Contributions to the History of Certain Conifers. Journal of the Linnean Society, vol. xxii. pp. 169–212, tt. 2–10. 1886.

Plantae Lehmannianae in Guatemala, Costarica et Columbia collectae. Passifloraceae et Aristolochiaceae. Engler's Botanische Jahrbücher, vol. viii. pp. 216–221. 1887.

On the Floral Conformation of the genus Cypripedium. Journal of the Linnean Society, vol. xxii. pp. 402–422, ff. 1–10, t. 20. 1887.

Pinus monophylla. Annals of Botany, vol. ii. pp. 124–126. 1888.

A Heterodox Onion. Journal of Botany, vol. xxvi. 1888, p. 219. 1888.

Les Skimmia. Revue de l'Horticulteur Belge, vol. xv. pp. 123–124. 1889.

Double-flowered Ceanothus. Annals of Botany, vol. iv. pp. 164–165. 1889.

Abies lasiocarpa Hook. and its allies. Journal of Botany, vol. xxvii. 1889, pp. 129–138. 1889.

An Erratic Ivy. Journal of Botany, vol. xxvii. 1889, pp. 172–176, ff. 1 & 2. 1889.

National Rose Conference. Rose Construction—Normal and Abnormal. Journal of the Royal Horticultural Society, new series, vol. xi. p. 228. 1889.

Review of some Points in the Comparative Morphology, Anatomy, and Life-History of the Coniferae. Journal of the Linnean Society, vol. xxvii. pp. 226–332, ff. 1–29. 1890.

Remarks on the Morphology of Rosa berberifolia, Pallas. Bulletin de la Société Royale de Botanique de Belgique, xxviii pp. 135–142. 1890.

Sports. Garden and Forest, vol. iii. pp. 162–164; Nature, vol, xlii. pp. 154–157. 1890.

Trees and Shrubs for large towns. Journal of the Royal Horticultural Society, new series, vol. xiii. pp. 71–98, ff. 9–16. 1891.

The Germination of Cyclamen. Journal of the Royal Horticultural Society, new series, vol. xiii. pp. 169–172, f. 21. 1891.

Some Features of Interest in the Order of Conifers. Journal of the Royal Horticultural Society, new series, vol. xiv. pp. 1–18. 1892.

A List of the Conifers and Taxads in Cultivation in the Open Air in Great Britain and Ireland. Journal of the Royal Horticultural Society, new series, vol. xiv. pp. 179–256. 1892.

Notes on the Genera of Taxaceae and Coniferae. Journal of the Linnean Society, vol xxx. pp. 1–42. 1893.

On some cases of Inversion. Journal of Botany, vol. xxxi. 1893, pp. 35–40, ff. 1–5. 1893.

Synanthy in Bellis. Annals of Botany, vol. vii. pp. 381–383, ff. 1–6. 1893.

The Cypresses of Monterey. Garden and Forest, vol. vii. p. 298. 1894.

The Cedar of Goa. Journal of the Royal Horticultural Society, new series, vol. xvii. pp. 1–11. 1895.

A General View of the genus Cupressus. Journal of the Linnean Society, vol. xxxi. pp. 312–363, with numerous figures in the text. 1896.

Substitutes for Larch. Journal of the Royal Horticultural Society, new series, vol. xix. pp. 430–436. 1896.

Thiselton-Dyer, Sir W. T., Flora Capensis, vol. vii. pp. 59–149. Restiaceae. 1897.

Suggestions for the better Utilisation of Chiswick Gardens. Journal of the Royal Horticultural Society, new series, vol. xxi. pp. 161–173. 1897.

Campanula Balchiniana ×. Journal of the Royal Horticultural Society, new series, vol. xxi. pp. 271–273, f. 63. 1897.

De Coniferis quibusdam sinicis vel japonicis Adnotationes quaedam. Bulletin de l'Herbier Boissier, vol. vi. pp. 269–274. 1898.

The Bermuda Juniper and its Allies. Journal of Botany, vol. xxxvii. 1899, pp. 1–11. 1899.

Conference on Hybridisation and Cross-Breeding. Introductory Address. Journal of the Royal Horticultural Society, new series, vol. xxiv. pp. 55–58. 1899.

Restionaceae novae capenses herbarii Berolinensis, imprimis Schlechterianae. Engler's Botanische Jahrbücher, vol. xxix. Beiblatt n. 66, pp. 1–20. 1900.

Taxodium & Glyptostrobus. Journal of Botany, vol. xxxviii. pp. 37–40. 1900.

New Plant. Erigeron neomexicanus. Journal of the Royal Horticultural Society, new series, vol. xxvi. p. 281. 1901.

Hybrid Conifers. Journal of the Royal Horticultural Society, new series, vol. xxvi. pp. 97–110, ff. 25–33. 1901.

Beiträge zur Kenntnis der Afrikanischen Flora, Neue Folge, xiii. herausg. von H. Schinz. Restionaceae (Restio praefixus, Mast.). Bulletin de l'Herbier Boissier, 2me série, vol. i. pp. 778–779. 1901.

The Coniferae in Forbes and Hemsley's Enumeration of the Plants of China. Journal of the Linnean Society, vol. xxvi. pp. 540–559. 1902.

The Arrangement of the Air-Canals in the Stalks of Nymphaeas. Journal of the Royal Horticultural Society, new series, vol. xxvi. pp. 840–843, f. 343. 1902.

Chinese Conifers collected by E. H. Wilson. Journal of Botany, vol. xli. pp. 267–270. 1903.

Hand-List of Coniferae grown in the Royal Botanic Gardens, Kew. Ed. 2 (revised by M. T. Masters). London, 1903. 8 vo. pp. i.–xxiii. + 1–145. 1903.

A General View of the Genus Pinus. Journal of the Linnean Society, vol. xxxv. pp. 560–659, tt. 20–23. 1904.

The Juniper Cedar of Jamaica. Bulletin of the Department of Agriculture, Jamaica, vol. ii. pp. 83–84. 1904.

Notes on the Genus Widdringtonia. Journal of the Linnean Society, vol. xxxvii. pp. 267–274. 1905.

On the Conifers of China. Journal of the Linnean Society, vol. xxxvii. pp. 410–424. 1906.

Correction of Widdringtonia equisetiformis to Callitris robusta. Journal of the Linnean Society, vol. xxxvii. p. 332. 1906.

On the Distribution of Conifers in China and Neighbouring Countries. Journal of the Linnean Society, vol. xxxviii. (posthumous). 1907.

W. B. H.

The Transport of Para Rubber Seeds.—One of the earliest recommendations with regard to this subject is that made by Dr. (now Sir) George King, Superintendent of the Royal Botanic Garden, Calcutta, in 1876. One of the most recent is to be found in the Report of the Department of Public Gardens and Plantations,

Jamaica, for 1905–6. A comparison of the two is of interest historically, and may be of use. The two are accordingly here reproduced.

"No. 11G, dated Howrah, the 22nd February, 1876.

"From Dr. G. KING, M.D., Superintendent. Royal Botanical Gardens, to the ACTING ASSISTANT SECRETARY to the Government of Bengal.

"With reference to your endorsement, No. 350 (Financial Department—Forests), dated 4th instant, I have the honour to submit herewith my suggestions as to the collection of seeds of *Hevea brasiliensis* in South America for transmission to the India Office, and from thence to Ceylon—

"I would suggest that—

* * * *

"They should not be all packed in one way. Some should be packed as recommeded by Dr. Thwaites, in slightly moist moss; others should be packed with dry moss in simple canvas bags; others should be tried in similar bags, but without moss or any other packing material; others should be sent in small boxes made of seasoned wood, and with a few small air-holes drilled in them to allow of ventilation; some should also be packed in boxes with perfectly dry soil as packing material, and others in similar boxes in finely pounded dry charcoal; finally, a quantity of the seeds should be tried in the following mode suggested by an experienced collector: 'Mix clay and water into a good stiff paste, and put a coat of this on each seed; dry these coated seeds gently in a shady place, and pack in small boxes.' In no case should any of the packages, except those packed in damp moss, be enclosed in india-rubber or other waterproof covering. Such covering effectually prevents ventilation, and is most prejudicial."

The Report of the Department of Public Gardens and Plantations of Jamaica for 1905–6 contains an account of the results of importations into Jamaica during the year. The report says:—

"A consignment of 7,500 seeds, packed with incinerator earth and sawdust, in biscuit tins, was forwarded from Singapore by parcel post on 31st August, and arrived in Jamaica on 25th October, 1905. Forty-five seeds were rotten when received; 7,455 seeds were sown, and of these 6,506 germinated, or 87 per cent. Of the 6,506 plants potted, 1,435 were constitutionally weak, and died soon after potting. There were thus obtained 5,071 plants, or about 68 per cent. of the number of seeds sown.

"On 30th January, 1906, 725 seeds were received from Para. They were packed in powdered charcoal, and only 15 were bad on arrival. From the 710 seeds sown, 656 plants were raised, or about 90 per cent.

"It does not appear to make any difference what the packing material may be, so long as it is dry. Sifted dry earth is, perhaps, the best material to recommend, as it is always possible to obtain it."

Presentations to Museums.—FORESTRY EXHIBITS.—Miss Talbot, Margam Park, Glamorgan, has presented to the Museum the following specimens of home-grown timbers :—

I. Section of young Sycamore (*Acer Pseudo-platanus*) showing effect of pruning.

II. *Sequoia gigantea* to illustrate branch formation.

III. Plank of Larch (*Larix europaea*).

The Right Hon. the Earl Bathurst, C.M.G., Cirencester Park, Gloucester, has presented a plank of Scotch Fir (*Pinus sylvestris*).

Col. Sir Ivor Herbert, Bart., C.B., M.P., Llanarth Court, Raglan, Monmouth, has presented an interesting and valuable series of timbers grown on the Llanarth Estate, Monmouth.

J. M. H.

Botanical Magazine for July.—The plants figured are : *Odontoglossum Leeanum*, Reichb. f., *Montanoa mollissima*, Brongn., *Kennedya retrorsa*, Hemsl, *Stewartia Malachodendron*, Linn., and *Phyllodoce Breweri*, Maxim. The *Odontoglossum* is a natural hybrid, of which the parents are supposed to be *O. gloriosum*, Lind. et Reichb. f. and *O. triumphans*, Reichb. f. The figure was prepared from an inflorescence sent to Kew by Baron Schröder, The Dell, Egham. *Montanoa mollissima* is a white-flowered Mexican Composite, not unlike a small-flowered *Dahlia*. The Kew plants were raised from seed received in 1902 from the late Sir Thomas Hanbury, and are grown in a greenhouse. *Kennedya retrorsa* is a new species from Eastern Australia, very distinct in its densely retrorse-pilose pods. The seeds from which the Kew plants were raised were received from the Sydney Botanic Gardens under the name of *K. procurrens*, Benth. Its flowers are rose-purple, with a white spot on the standard. *Stewartia* (often written *Stuartia*) *Malachodendron* is a white-flowered shrub or small tree, native of Eastern North America, and allied to the genus *Camellia*. Though an old inhabitant of English gardens it is not in general cultivation. The specimen figured came from a plant in Sir J D. Hooker's garden at Sunningdale. It is hardy at Kew. *Phyllodoce Breweri* is a pretty Ericaceous plant from the Alpine zone of the Californian Sierras. It flowers at Kew in May and is quite hardy, but a slow grower. Seeds of this plant were presented to Kew in 1896 by the late Baron von Saint Paul-Illaire, of Fischbach, Silesia, the founder and President of the German Dendrological Society, who died on October 21, 1902. He was a frequent correspondent of Kew, having first written to the Director in 1881, asking for assistance in his endeavour to introduce foreign plants, especially trees, into Germany, an object which he had very much at heart. He sent in exchange seeds and plants to the Gardens, and contributed to the library the *Mitteilungen der Deutschen Dendrologischen Gesellschaft* from their first appearance in 1893 to the time of his death.

Botanical Magazine for August.—*Aloe nitens*, Baker, *Bruckenthalia spiculifolia*, Reichb., *Calathea angustifolia*, Koern., *Streptocarpus Holstii*, Engler, and *Delphinium macrocentron*, Oliver, are figured and described. The *Aloe* is a South African species which has been in cultivation at Kew since the year 1877, when it was received from the late Sir Henry Barkly, at that time Governor at the Cape. It is a handsome plant, the stem reaching a height of 12 ft., and bearing a panicle of about six branches, each terminated by a dense spike of rich crimson flowers. These are produced in midwinter. *Bruckenthalia* is a monotypic genus of *Ericaceae* closely resembling a small-flowered *Erica*, but differs in having a campanulate calyx, and in the almost complete absence of a disc. It is a native of Transylvania, the Balkan Peninsula, and Northern Asia Minor. The Central American *Calathea angustifolia* has been in cultivation at Kew for many years. Like many of its congeners this species has ornamental foliage. Its leaves reach a height of about 4 ft.; the blade is about 2 ft. long, green above and purple beneath, borne on a petiole 2 ft. long. The scape is much shorter than the petiole, and bears a dense spike of pale yellow flowers. *Streptocarpus Holstii*, from East Tropical Africa, is an elegant branching herb about 18 in. high, with small stalked leaves and small mauve-purple flowers, having a white throat. The Kew plants were raised from seeds received from the Berlin Botanic Garden in 1905. The *Delphinium* is a native of the mountains of East Tropical Africa, and was introduced into cultivation by the Hon. Walter Rothschild, who received it from Mount Elgon in the Uganda Protectorate. The specimen figured was grown in a pot in the garden of Mr. James O'Brien at Harrow-on-the-Hill. It is a hairy perennial herb, growing 5 ft. high or more, with large blue and green or yellow and green flowers, whitish at the apex. Mr. O'Brien thinks it may prove hardy in this country.

Seedling Sugar-Canes in the West Indies.—In the last number of this *Bulletin* (No. 7, 1907, p. 306), reference was made to the question of the identity of the Barbados seedling, B. 208, cultivated on the well-known Diamond Plantation in Demerara, and the result of a critical examination of samples by the Imperial Department of Agriculture was given. We now learn that the subject has been also submitted for investigation and report to a Departmental Committee appointed by the Governor of British Guiana.

The report of this Committee, which is dated June 6, 1907, is as follows :—

"With reference to your letter No. 3428 of the 3rd instant, "appointing a Committee to inquire into the identity of the cane "grown at Plantation 'Diamond' as B. 208, we have the honour "to report that after an examination of the seedling in cultivation "at Plantation 'Diamond' under the name of B. 208, we are of "opinion that there has been no mistake as to its identity as "such."

Canhamo Braziliensis Perini.—The *Board of Trade Journal* for 7th September, 1905, records the receipt by the Board of a pamphlet describing, under this name, a Brazilian fibre plant, together with a sample of its fibre, forwarded by H.B.M. Consul at Rio de Janeiro. Subsequently, Messrs. Knight, Harrison & Co., of Rio de Janeiro, kindly forwarded to Kew copies of this pamphlet which was written by Dr. V. A. de Perini for the *Brazilian Review* in 1905, and is entitled "Canhamo Braziliensis Perini or Brazilian Linen"; with these were sent samples of the fibre and of cloth woven from it in Italy.

The pamphlet states that the plant was discovered by Dr. de Perini in the northern part of the province of Minas Geraes at about 1,000 feet above sea-level. The writer of the pamphlet claims that the plant possesses the qualities of European Hemp or Flax; that it is quite hardy both in the dry and in the rainy season; that it thrives alike in dry and in wet soil, and that it does not suffer from insect attacks or from mildew. No care or special cultivation is needed; a crop can be gathered three months after sowing, and three crops can be harvested in one year. The fibre possesses the desirable qualities of strength, fineness, flexibility, and adaptability for bleaching or dyeing. From it a fabric can be prepared which is equal to European linen; this so far has not been possible in America.

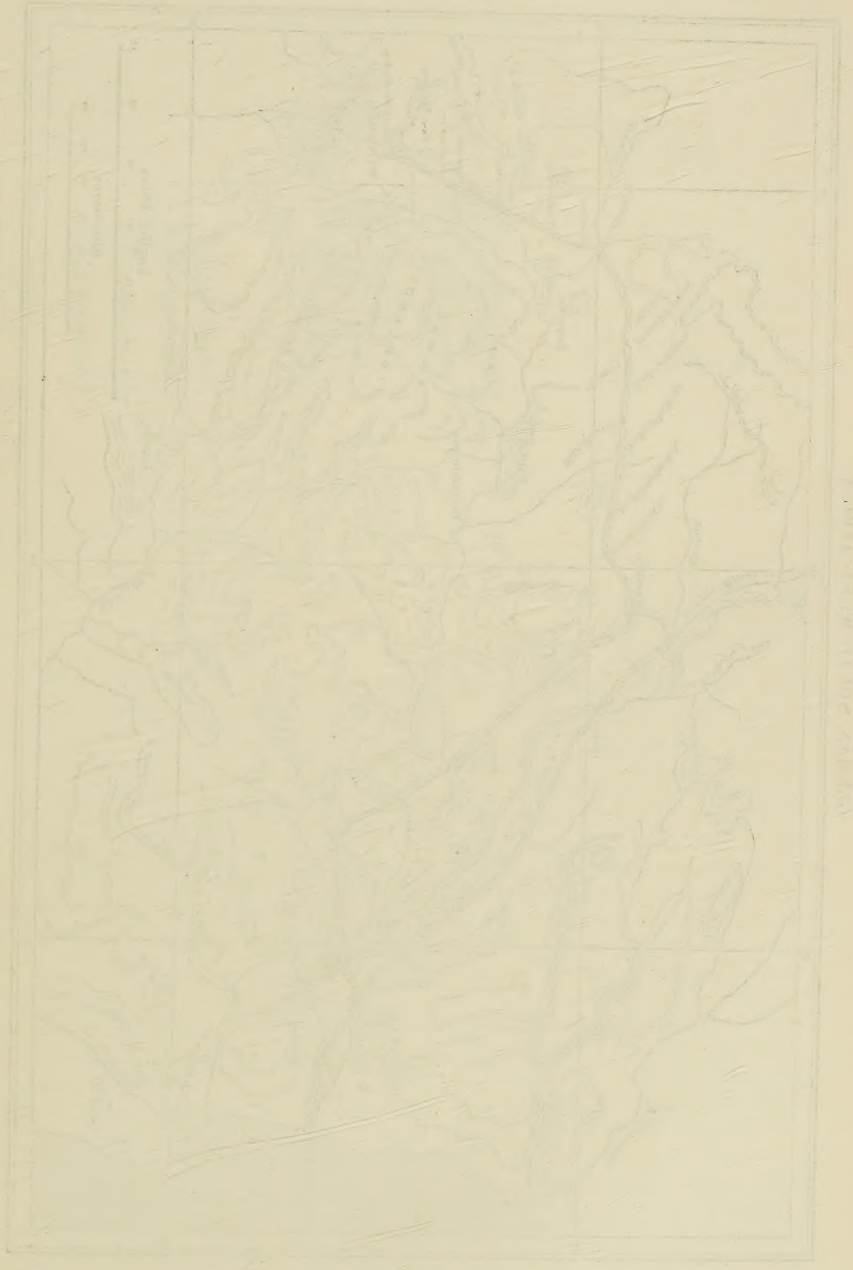
From the illustrations given in the pamphlet referred to and from a comparison of the fibre with the material in the museum at Kew it was clear that the plant under discussion is a *Hibiscus* (*Malvaceae*), nearly allied to *H. cannabinus*, Linn., which is widely grown in most warm countries, and is best known as the source of Deccan or Ambari Hemp, the fibre of which has been exported to England from India for over a century. The differences, however, were such as to indicate that the Brazilian plant is probably not exactly *H. cannabinus*.

The *Board of Trade Journal* for 28th February, 1907, had the following note on the subject:—

"With reference to the Brazilian Linen plant the acting British "Consul-General at Rio de Janeiro (Mr. D. R. O'Sullivan Beare), "reports that the Brazilian Legislature have voted the grant of an "annual subsidy of thirty contos of reis (about £1,875) during a "period of five years to Dr. Perini, the discoverer and the holder "of the patent rights for Brazil in connection with the utilisation "of the plant in question. The subsidy will be paid as soon as "Dr. Perini has inaugurated the manufacture in Brazil of "articles made from the plant. Dr. Perini proposes to form "a limited liability company to exploit his plant, and has issued "a prospectus. The capital is to be 1,200 contos of reis (£75,000) "in 6,000 shares of the value of 200 milreis each."

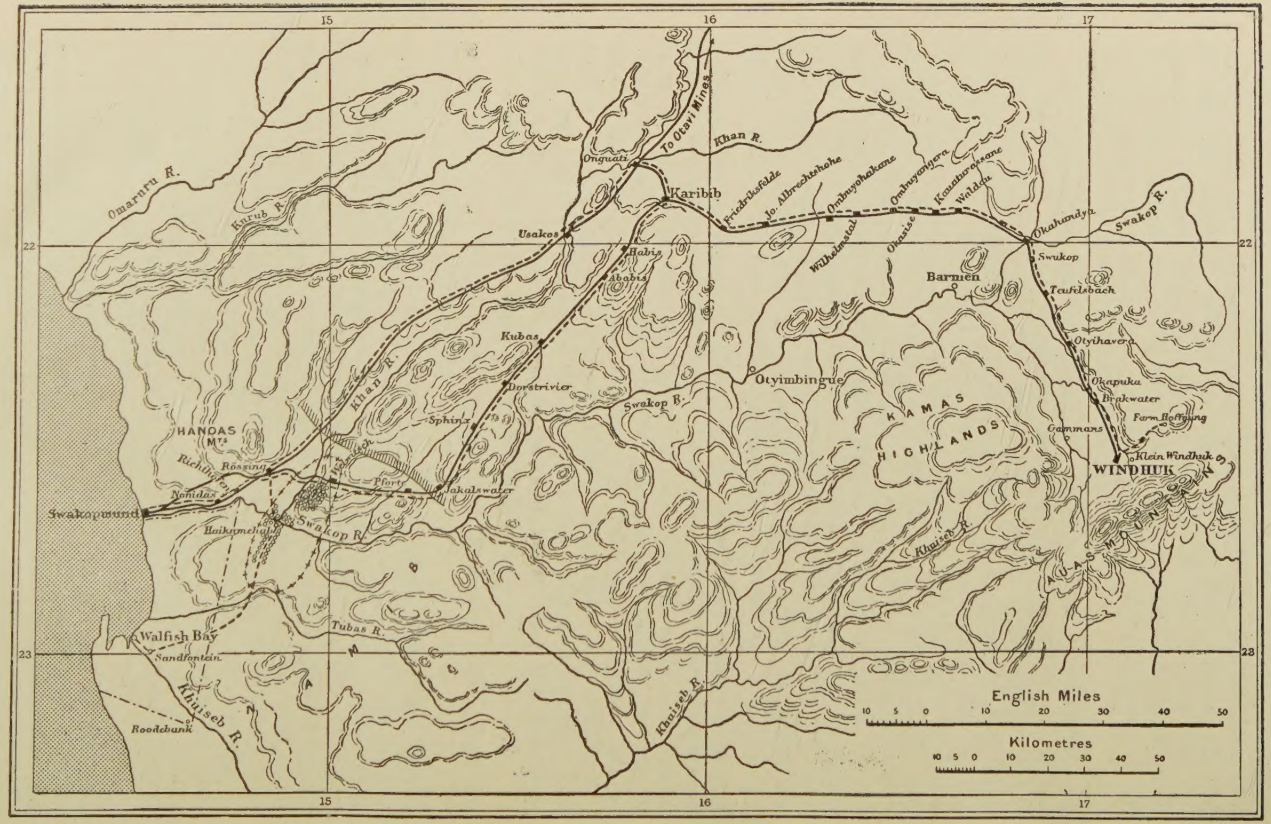
In April, 1907, specimens of the dried plant and of its seeds were received from the Board of Trade. Plants have been raised from the seeds, and from these it has been possible to ascertain that the species is *Hibiscus radiatus*, Sims, not of Benth., doubtfully of Cav.

J. M. H.



29709

MAP OF THE CENTRAL PART OF
GERMAN SOUTH WEST AFRICA



Route followed --------- Where Welwitschia was seen Supposed boundary of Welwitschia

Transition from the Namib to Acacia forest

To face p. 339.